

MEASUREMENT OF NITROGEN CONTENT IN A  
GAS MIXTURE BY TRANSFORMING THE  
NITROGEN INTO A SUBSTANCE DETECTABLE  
WITH NONDISPERSIVE INFRARED DETECTION

Inventors: Thomas E. Owen, et al.

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GAS COMPONENT (DISSOCIATION)	MOLE %	COMPUTATION PATH	IONIZATION POTENTIAL (eV)	CHEMICAL BOND STRENGTH (kj/mol)
1-BUTANE AND C <sub>5</sub> +	0.50	C <sub>4</sub> H <sub>10</sub> + e <sup>-</sup> → C <sub>4</sub> H <sub>9</sub> <sup>+</sup> + H <sup>o</sup> + 2e <sup>-</sup>	10.57	411.1
PROPANE	0.80	C <sub>3</sub> H <sub>8</sub> + e <sup>-</sup> → C <sub>3</sub> H <sub>7</sub> <sup>+</sup> + H <sup>o</sup> + 2e <sup>-</sup>	10.95	413.0
ETHANE	1.50	C <sub>2</sub> H <sub>8</sub> + e <sup>-</sup> → C <sub>2</sub> H <sub>5</sub> <sup>+</sup> + H <sup>o</sup> + 2e <sup>-</sup>	11.52	422.8
METHANE	95.00	CH <sub>4</sub> + e <sup>-</sup> → CH <sub>3</sub> <sup>+</sup> + H <sup>o</sup> + 2e <sup>-</sup>	12.51	438.5
DILUENT CARBON DIOXIDE	1.30	CO <sub>2</sub> + e <sup>-</sup> → CO <sup>+</sup> + O + 2e <sup>-</sup>	13.773	532.2
DILUENT NITROGEN	1.00	N <sub>2</sub> + e <sup>-</sup> → N <sup>+</sup> + N + 2e <sup>-</sup>	15.581	945.3
METHYL (CH <sub>3</sub> // CH <sub>4</sub> )		CH <sub>3</sub> <sup>+</sup> + e <sup>-</sup> → CH <sup>2+</sup> + H <sup>o</sup> + 2e <sup>-</sup>	9.84	1095.0
GAS COMPONENT (ASSOCIATION)	MOLE %	COMPUTATION PATH	ENTHALPY OF FORMATION (kj/mol)	REQUIRED SOURCE COMPONENT
2-BUTANOL	0.4	3CH <sub>3</sub> <sup>o</sup> + H <sup>o</sup> + O → C <sub>3</sub> H <sub>10</sub> O	658	CO <sub>2</sub>
ETHANOL	0.3	2CH <sub>3</sub> <sup>o</sup> + O → C <sub>2</sub> H <sub>6</sub> O	776	CO <sub>2</sub>
ETHANOL	0.3	C <sub>2</sub> H <sub>6</sub> + O → C <sub>2</sub> H <sub>6</sub> O	776	CO <sub>2</sub>
METHANOL	0.3	CH <sub>4</sub> + O → CH <sub>4</sub> O	845	CO <sub>2</sub>
AMMONIA	2.0	N + 3H <sup>o</sup> → NH <sub>3</sub>	934	N <sub>2</sub>
ETHANE	5.7	2CH <sub>3</sub> <sup>o</sup> → C <sub>2</sub> H <sub>6</sub>	1027	CH <sub>4</sub>
METHANE	91.0	CH <sub>3</sub> <sup>o</sup> + H <sup>o</sup> → CH <sub>4</sub>	1133	CH <sub>4</sub>
2-BUTANOL		H <sup>o</sup> + O → HO <sup>o</sup>	1293	CO <sub>2</sub>
HYDROXYL		CH <sub>3</sub> <sup>o</sup> + HO <sup>o</sup> → CH <sub>4</sub> O	845	CO <sub>2</sub>
METHANOL		3CH <sub>2</sub> <sup>o</sup> + H <sup>o</sup> + HO <sup>o</sup> → C <sub>3</sub> H <sub>8</sub> O	704	CH <sub>3</sub> /CO <sub>2</sub>
2-PROPANOL		4CH <sub>3</sub> <sup>o</sup> + 2H <sup>o</sup> + O → C <sub>4</sub> H <sub>10</sub> O	658	CH <sub>3</sub> /CO <sub>2</sub>

FIG. 1

MEASUREMENT OF NITROGEN CONTENT IN A  
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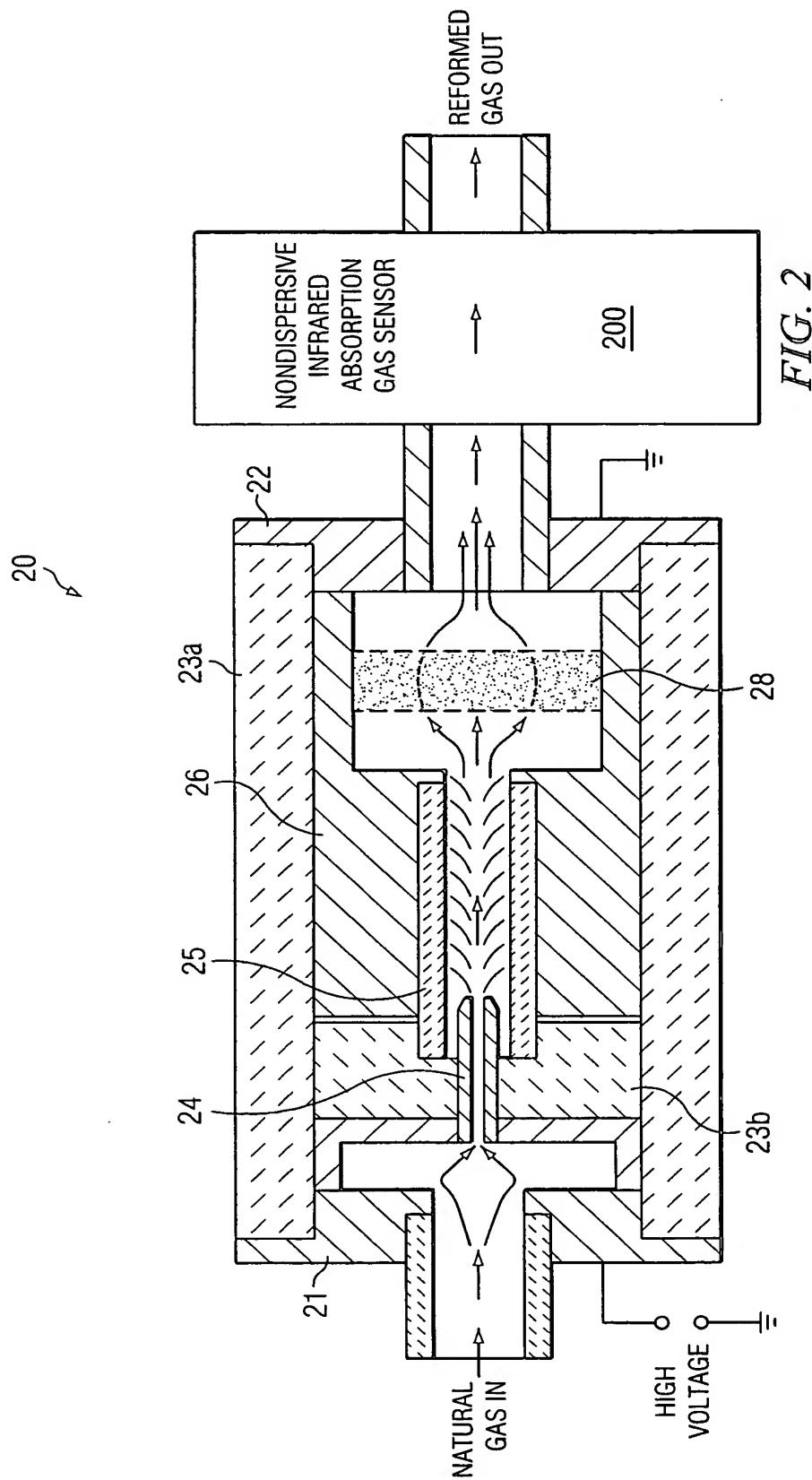


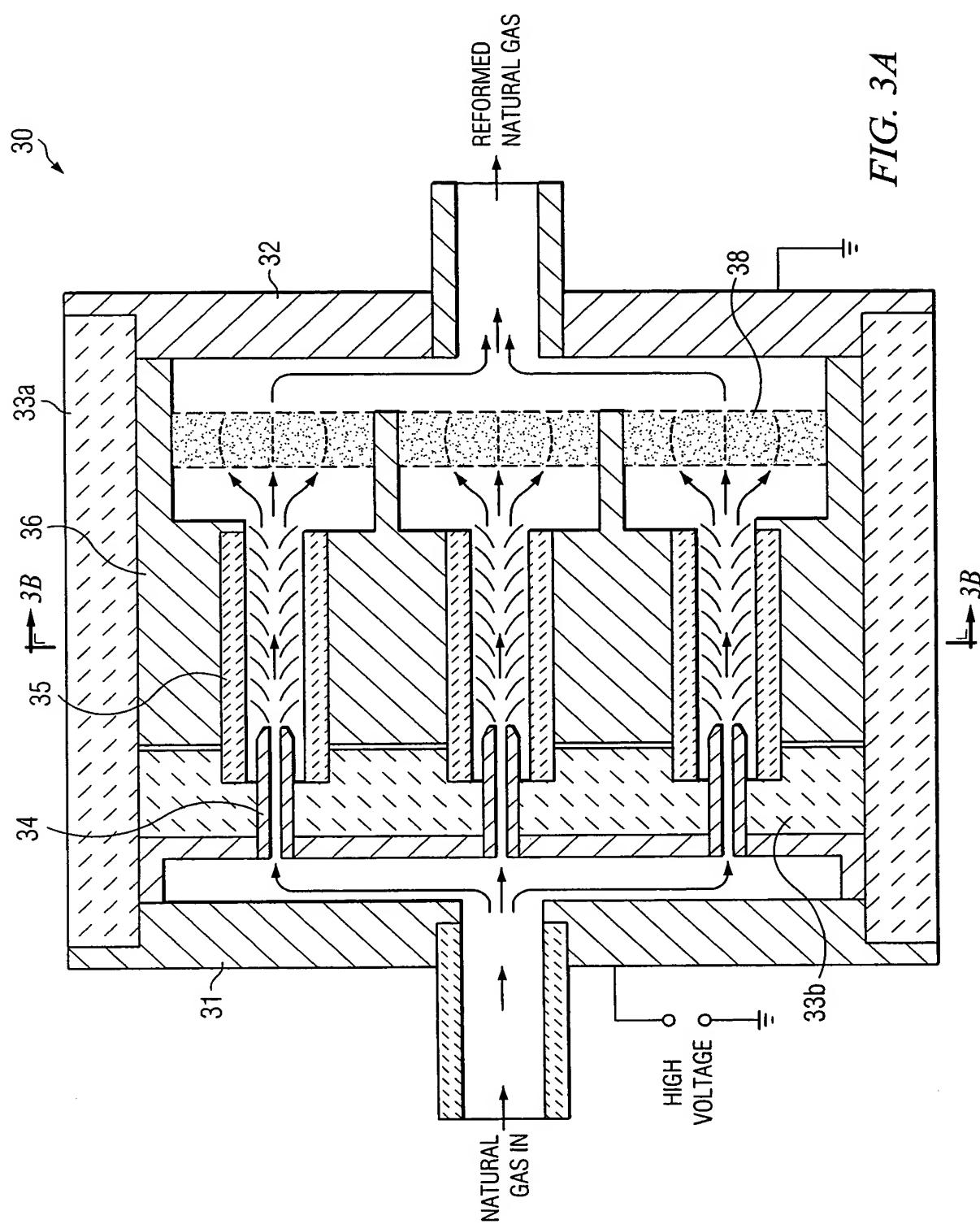
FIG. 2

MEASUREMENT OF NITROGEN CONTENT IN A  
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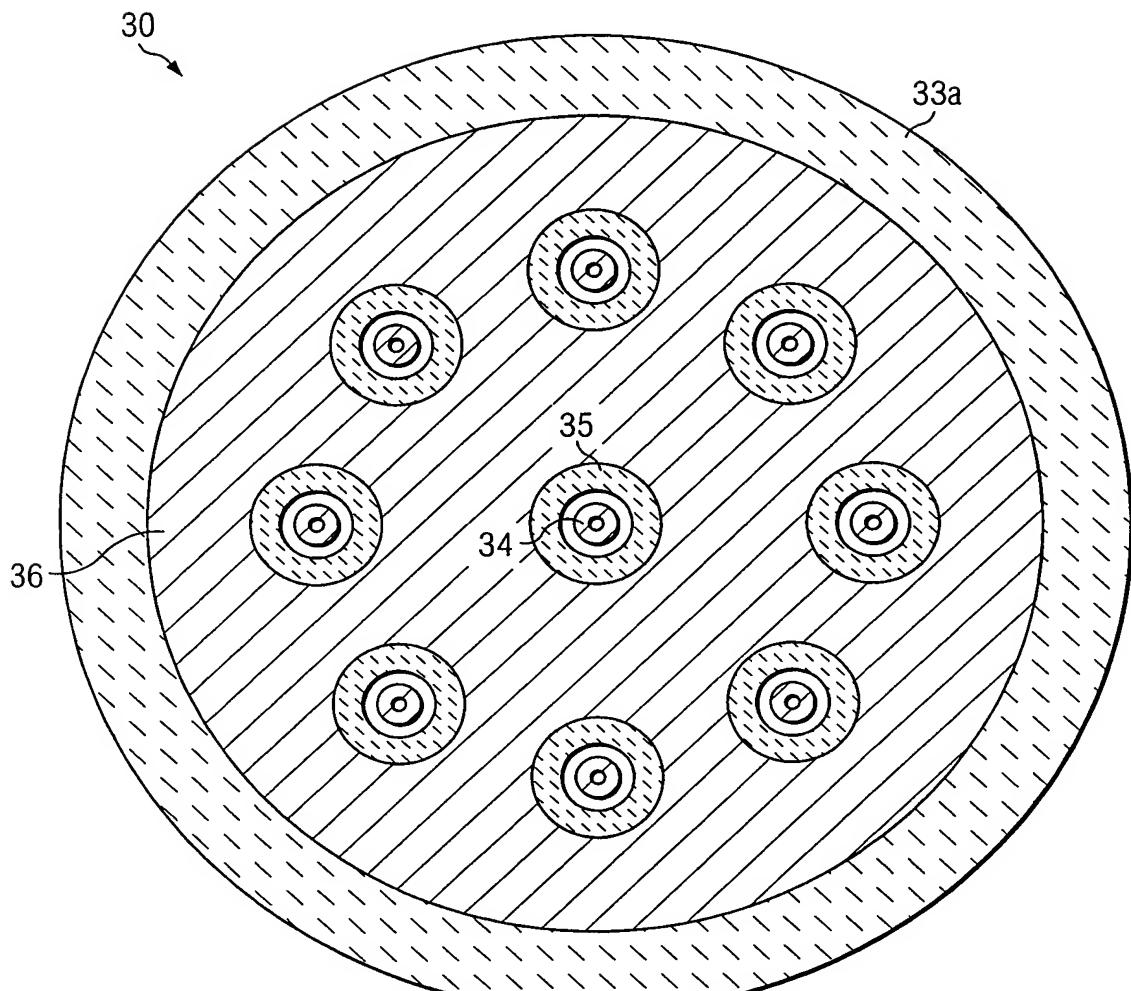
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*FIG. 3B*

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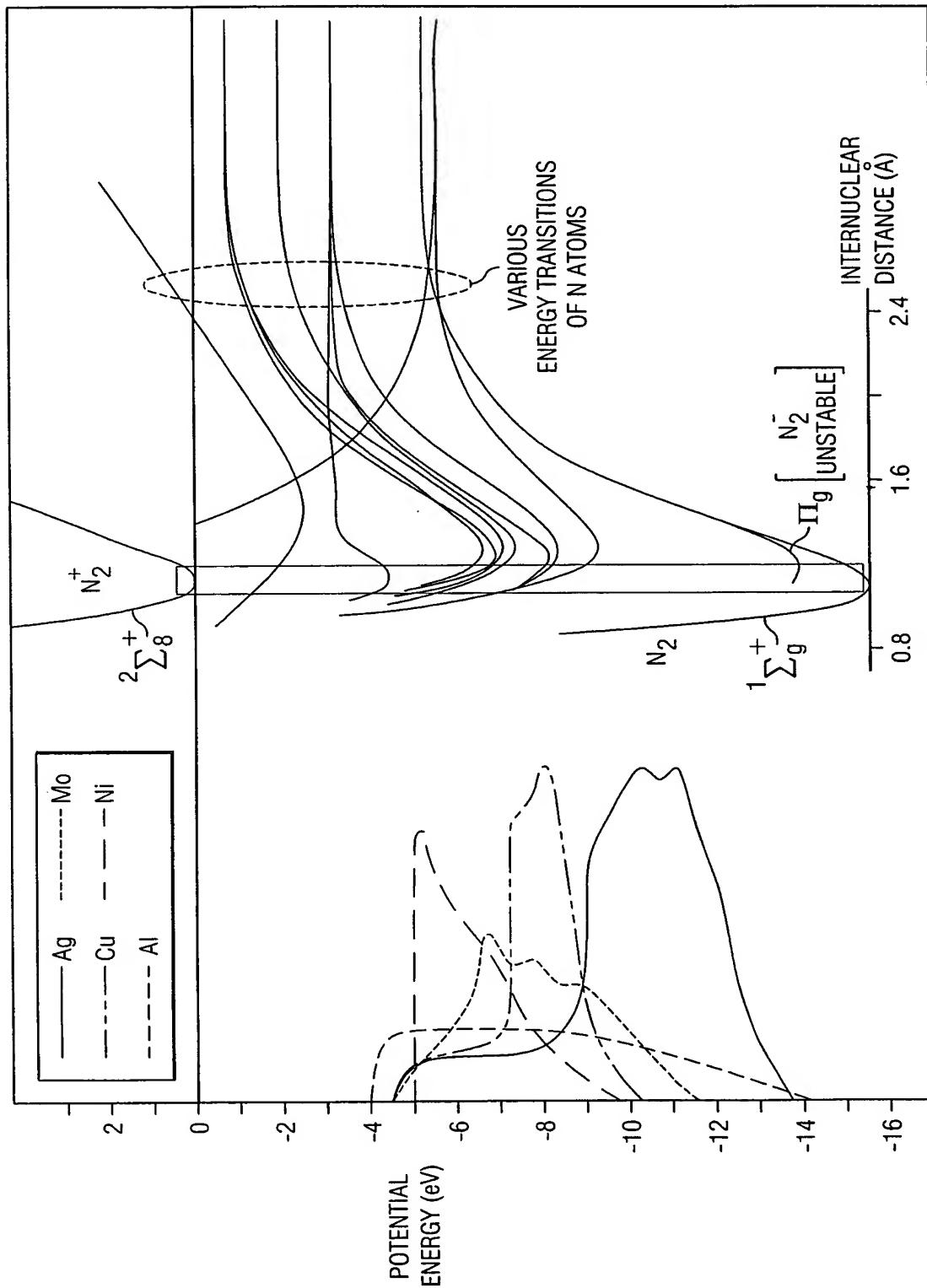


FIG. 4

# MEASUREMENT OF NITROGEN CONTENT IN A GAS MIXTURE BY TRANSFORMING THE NITROGEN INTO A SUBSTANCE DETECTABLE WITH NONDISPERSIVE INFRARED DETECTION

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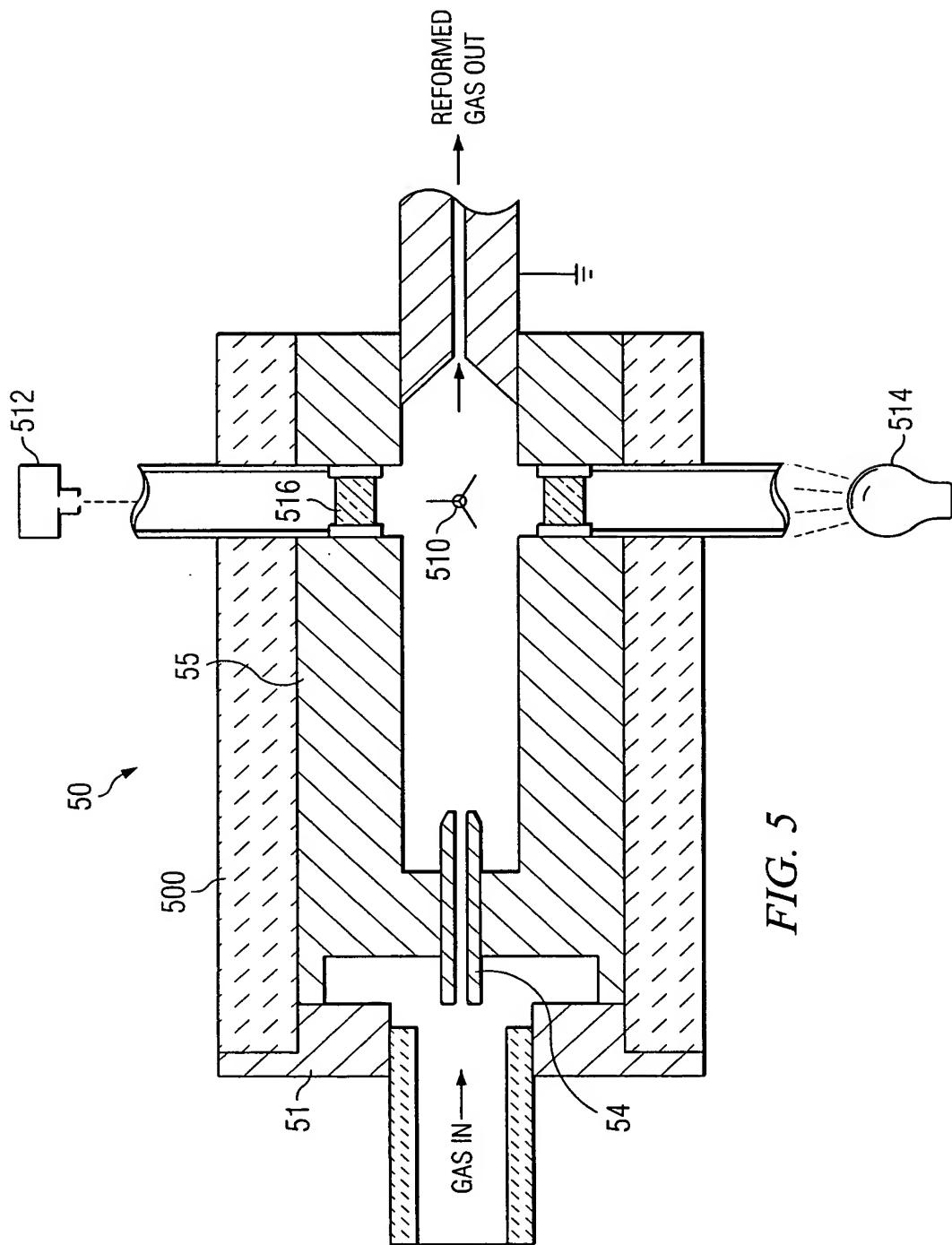


FIG. 5